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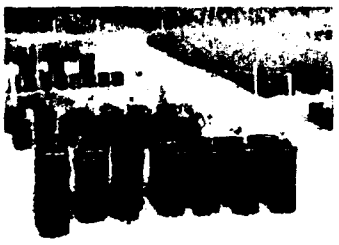

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AUTUMN OLIVE (*Elaeagnus umbellata*)

Section 7.5.7, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

by

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A plant materials report on autumn olive (*Elaeagnus umbellata*) is provided as Section 7.5.7 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report was prepared as a guide to assist project/installation natural resources personnel with the selection, establishment, and management of appropriate plant materials for wildlife and habitat development programs. Major topics covered are description, distribution, habitat requirements, wildlife and land management value, establishment, maintenance, and cautions and limitations.

Autumn olive is a hardy shrub or small tree introduced into the United States from Asia. It is widely used in the East in habitat improvement projects designed to attract wildlife, provide barriers, beautify existing landscapes, and reclaim disturbed sites. Autumn olive is tolerant of a wide range of soils and climatic conditions. Plants grow best on well-drained soils that are deep, sandy, loamy, or moderately fine-textured. Establishment of autumn

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olive is often recommended for borders, hedgerows, windbreaks, and disturbed sites.

Planting stock of autumn olive is readily available, and some commercial nurseries produce propagules in quantity. Four cultivars (Cardinal, Ellagood, Elsberry, and Redwing) have been developed and are adapted to geographically specific regions. This report provides information on management objectives, site selection and preparation, propagule selection, planting methods, and maintenance requirements for autumn olive throughout its area of potential use. Management cautions and limitations are discussed, and guidelines are provided on the appropriate use of autumn olive in wildlife and habitat management programs.

PREFACE

This work was sponsored by the US Army Corps of Engineers (USACE) Environmental Impact Research Program (EIRP) and the Department of Defense (DOD) military branches under the DOD Natural Resources Program. Technical Monitors for the study were Dr. John Bushman, Mr. David P. Buelow, and Mr. Dave Mathis of the Headquarters, USACE, and representatives of the Fish and Wildlife Committee of the Defense Natural Resources Group, DOD. The report serves as a section of the USACE Wildlife Resources Management Manual, as developed by the Headquarters, USACE, under EIRP Work Unit 32420.

This report was prepared by Dr. Phillip L. Dittberner, Dr. Donald R. Dietz, and Mr. Clinton H. Wasser of Natural Resource Professionals, Fort Collins, Colo., under Contract No. DACA39-88-0091 with the US Army Engineer Waterways Experiment Station (WES); and by Mr. Chester O. Martin and Dr. Wilma A. Mitchell of the Environmental Laboratory (EL), WES. Mr. Wasser is Professor Emeritus in the Range Science Department, Colorado State University, Fort Collins, Colo. Mr. Martin, Team Leader, Wildlife Resources Team, Resource Analysis Group (RAG), EL, was principal investigator for the work unit. Review and comments were provided by Dr. H. Glenn Hughes, Mr. Kevin L. Grosz, and Dr. William P. Kuvlesky, WES. Dr. Hughes was on sabbatical to WES from the Pennsylvania State University, DuBois Campus. Mr. Grosz, formerly with North Dakota State University under contract to WES, is presently with The Resource Company, Vancouver, Washington. Dr. Kuvlesky is under contract to WES from the Department of Wildlife and Fisheries Sciences, Texas A&M University.

The report was prepared under the general supervision of Mr. H. Roger Hamilton, Chief, RAG; Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL; and Dr. John Harrison, Chief, EL. Dr. Roger T. Saucier was Program Manager, EIRP.

Dr. Robert W. Whalin was Director of WES. COL Leonard G. Hassell, EN, was Commander and Deputy Director.

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NOTE TO READER

This report is designated as Section 7.5.7 in Chapter 7 -- PLANT MATERIALS, Part 7.5 -- WOODY SPECIES, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 7.

AUTUMN OLIVE (Elaeagnus umbellata)

Section 7.5.7, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL

Autumn olive (*Elaeagnus umbellata*) is a hardy shrub or small tree introduced into the United States from Asia. It is widely used in habitat improvement projects, primarily in the eastern states, to attract wildlife, provide barriers, beautify landscapes, and reclaim disturbed sites (Allan and Steiner 1972, Fowler and Adkisson 1980). Thickets or rows of mature plants can provide a supplemental seed source and protective cover for many species of wildlife, especially songbirds and small game species (Allan and Steiner 1972, Burger 1973). Plants tolerate a wide range of soil conditions but grow best in full sunlight on well-drained sites. Autumn olive may also be referred to as autumn elaeagnus, pink-fruited elaeagnus, or Japanese silverberry (Shomon et al. 1966, Olson 1974, DeGraaf and Witman 1979).

The genus *Elaeagnus*, placed taxonomically in the Oleaster family (Elaeagnaceae), includes approximately 40 species of trees or shrubs; it is represented in the United States primarily by a dozen or so cultivated species introduced from Europe and Asia. The single native species is silverberry (*E. commutata*), which occurs from Quebec to Yukon, Canada, south to New Mexico, and east to Nebraska (Harrington 1954, Olson 1974). Several of the introduced

species, e.g., Russian olive (*E. angustifolia*), have become widely naturalized, especially in the western states. The wildlife value of this genus results from the dense growth provided, generally heavy fruit production, and ability to grow on poor sites because of the presence of nitrogen-fixing bacteria on the roots (Coastal Zone Resources Division 1978).

DESCRIPTION

Diagnostic Characters

Autumn olive is a deciduous shrub with a widely spreading crown; it usually grows to a height of 10 to 15 ft (3.1 to 4.6 m) (Allan and Steiner 1972). The main trunk and larger branches are dark brown; the smaller branches are yellowish brown and somewhat spiny. Although the growth form of the species is normally a spreading shrub, individual plants may vary from narrow and upright to dwarf-sized with laterally spreading branches.

The single alternate leaves are 1 to 4 in. (2.5 to 10 cm) long with undulate margins, and range in shape from elliptic to ovate or ovate-lanceolate (Radford et al. 1968) (Fig. 1). The upper surfaces of the leaves are green with silvery scales, and the undersides are silver with brown scales. In the spring, autumn olive has an abundance of sweet-scented, white to yellow, trumpet-shaped flowers that are approximately 0.5 in. (12 mm) long. They appear in May and June and grow singly or in clusters along the twigs and small branches (Allan and Steiner 1972, Leighton and Simonds 1987).

The fruits of autumn olive are ovoid or globose drupes (usually referred to as berries) that average 0.25 in. (6 mm) in length (Radford et al. 1968) (Fig. 2). The long, semisoft, ribbed seed is contained within the fleshy outer covering of the drupe. The fruits are white to pinkish when immature but turn red and have brown scales at maturity; however, fruit that persists on the shrub turns yellow brown and becomes raisinlike. Fruit production is usually heavy in fall and persists to midwinter. The Cardinal variety of autumn olive usually produces heavy crops that mature by early October, but some strains ripen in September (Allan and Steiner 1972, DeGraaf and Witman 1979). Fruiting may occur as early as July in the Southeast (Dillon 1981).

Cultivars

The 4 recognized cultivars of autumn olive are 'Cardinal,' 'Ellagood,' 'Elsberry,' and 'Redwing,' which differ primarily in their adaptations to

Figure 1. Typical growth form and leaf shape of Cardinal autumn olive (*Elaeagnus umbellata*)

Figure 2. Close-up of mature fruit of Cardinal autumn olive (courtesy USDA Soil Conservation Service)

different climatic regions. The general characteristics described above pertain to all varieties; specific information on time of flowering and fruiting refers to the Cardinal variety. Additional traits specific to other cultivars are discussed below.

The Ellagood variety is unique among autumn olive cultivars in that only vegetatively propagated plants yield abundant food crops. The fruits ripen 30 to 60 days later than other commercially available varieties. Ellagood usually produces a more abundant food crop, and the leaves are larger and retained longer than the Cardinal variety. Compared to Cardinal, Ellagood has been rated as superior for fruit-ripening lateness, fruiting quality and retention, and leaf retention in the fall; it has also been rated as good or better for vigor and plant survival (SCS, undated).

The Elsberry variety has been reported to attain a height of 19 ft (5.8 m) in 12 years. Plants begin to leaf out in mid-March, and the foliage is usually full by 30 March. The fruits of Elsberry are larger than those of other cultivars and are retained well into the winter (SCS 1986).

Redwing autumn olive is a dense, shrubby variety that is ideal for screen or border plantings and may also be used effectively for windbreaks or

shelterbelts. It is more winter-hardy than other varieties and has large leaves and fruits. The fruits are red with green speckles and mature in early September, sometimes as much as 20 days earlier than other cultivars. Redwing is open-pollinated and seed-propagated (SCS 1987).

DISTRIBUTION

Autumn olive was introduced into the United States about 1830 from China or Japan. It grows in thickets along streams and roadsides throughout its native range from Afghanistan eastward through the Himalayas and northern India to Korea and Japan, where it may occur at elevations as high as 9000 ft (2742 m) (Allan and Steiner 1972).

In the United States, autumn olive has been established from New England south to Florida and the interior portions of the Gulf States and west to the central Great Plains (Fig. 3) (Allan and Steiner 1972, Zak et al. 1972, DeGraaf and Witman 1979, Vogel 1981). Cardinal autumn olive is generally adapted to conditions throughout most of the eastern and east-central states from Maine south to Georgia and northern portions of the Gulf states (Shomon et al. 1966, Allan and Steiner 1972, Olson 1974). It is also grown in some parts of the Midwest. Cardinal was the original cultivar developed commercially in the United States and has been more widely planted than any of the other varieties.

Elsberry has been grown successfully in Illinois, Kansas, southern Iowa, and central and southeastern Nebraska (SCS 1986). Redwing is adapted to most of the Northeast and the lower Great Lakes region south to Virginia, Kentucky, and Missouri, and west through most of Nebraska (SCS 1987). Plantings of Ellagood have been successful from New York and New Hampshire south to Florida and west to Texas; there is evidence of adaptation as far south as north-central Florida and in central Oklahoma and Texas, but attempts at establishment on dry sites in the western part of its range have been largely unsuccessful (SCS, undated).

Cardinal, Redwing, and Ellagood autumn olive have also been grown in northern California, western Oregon, and Washington. Redwing has been established in the Willamette Valley of Oregon (SCS 1987).

HABITAT REQUIREMENTS

Autumn olive is an adaptable species that is tolerant of a wide range of soils and climatic conditions. Plants grow best in full sunlight (Dumke 1982)

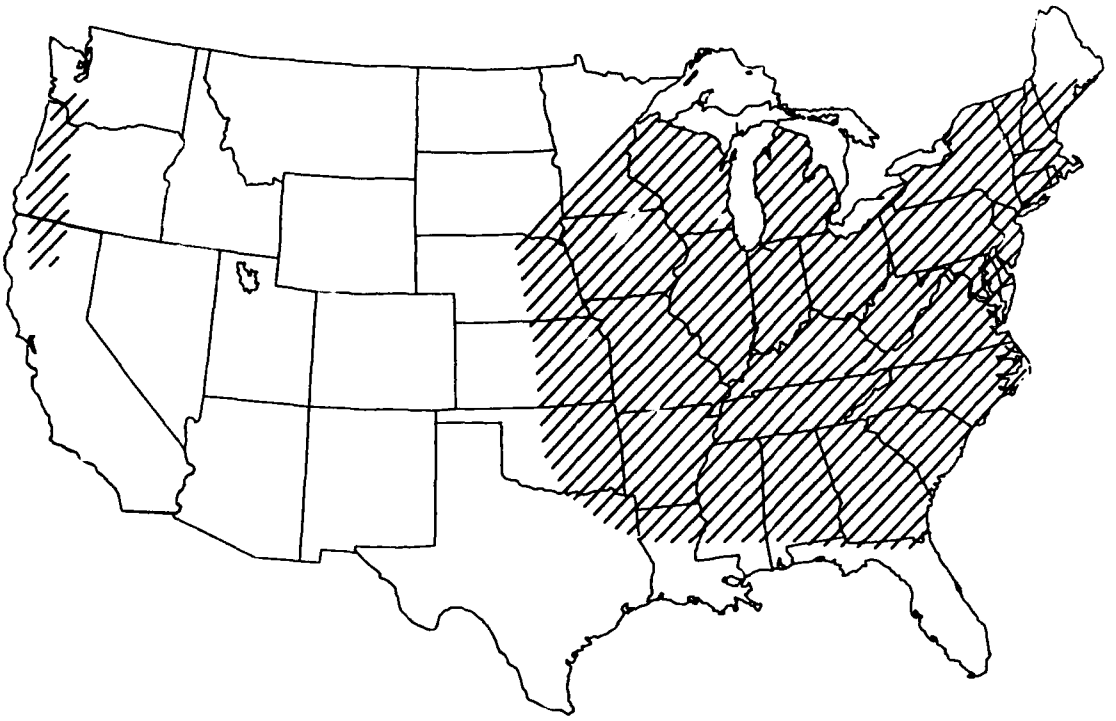

Figure 3. General distribution of autumn olive in the United States

but exhibit intermediate shade tolerance (Vogel 1981). Fruit production is decreased in shaded areas. Plants may be injured by extremely cold temperatures, but they will usually recover. Early growth may be slowed by competition from grasses, forbs, or other shrubs; however, plants usually overcome such competition (Allan and Steiner 1972).

Soils

Autumn olive grows best on deep sandy, loamy, and moderately fine-textured (clayey) soils that are moderately well to well drained (Allan and Steiner 1972). Dumke (1982) reported that autumn olive grew best on sandy loams in Wisconsin. The redwing variety is best adapted for growth on coarse-textured soils (SCS 1987).

Soils ranging from moderately acid to moderately alkaline are suitable for good growth. Grandt (1977) reported good survival of plants on strip-mine reclamation sites where the soil pH ranged from 4.0 to 8.0. On acid-mine spoils in Tennessee, Fowler and Adkisson (1980) reported poor survival and growth where the soil pH was below 3.0, moderate results at pH 3.0 to 3.5, and

good success at pH above 3.5. The Elsberry variety has performed well on acid-mine spoils with a pH of 4.0 or more.

Autumn olive does not require high soil fertility (Allan and Steiner 1972). In fact, plants are usually tolerant of infertile soils, as their roots are capable of nitrogen fixation (Dumke 1982, Leighton and Simonds 1987).

Moisture

Autumn olive has been reported to be very drought tolerant (Dumke 1982, Leighton and Simonds 1987). However, plants grow less vigorously on very dry soils. Autumn olive is not adapted to wet site conditions. Plantings will usually not survive on very shallow, poorly drained, or excessively wet soils (Allan and Steiner 1972).

MANAGEMENT USES

Establishment of autumn olive plantings has been recommended for habitat development, wildlife management, site restoration, and landscape improvement (Shomon et al. 1966, Allan and Steiner 1972, Olson 1974, Sharp 1977). The fresh fruit is sometimes consumed by humans but is considered too astringent for most tastes; jelly can be made from the fruit. Plants may have some value to beekeepers for honey production. Major uses of autumn olive are described below; wildlife value is discussed under a separate topic heading.

Habitat Development

Autumn olive has been commonly used in shrub plantings to provide wildlife food and cover and to beautify field corners, old fields, and roadsides. The plants may be established in strips, blocks, or clumps, depending on the management objectives of the site. Autumn olive is often planted as a border along field edges (Fig. 4) and is particularly suitable for borders along new plantations of conifers and other trees (Allan and Steiner 1972). As a hedgerow, plantings can provide a screen against unpleasant views and will discourage trespassing. The SCS (1969) recommended establishing a mixture of autumn olive, Tatarian honeysuckle (*Lonicera tatarica*), and dogwoods (*Cornus* spp.) to create "living fences" across fields. Conifers bordered by such species as autumn olive, dogwoods, and honeysuckles were suggested as "living screens" to obscure unpleasant views and provide privacy.

Autumn olive has been widely used for screening campgrounds and other recreational areas on State and Federal lands in the East. Continuous row

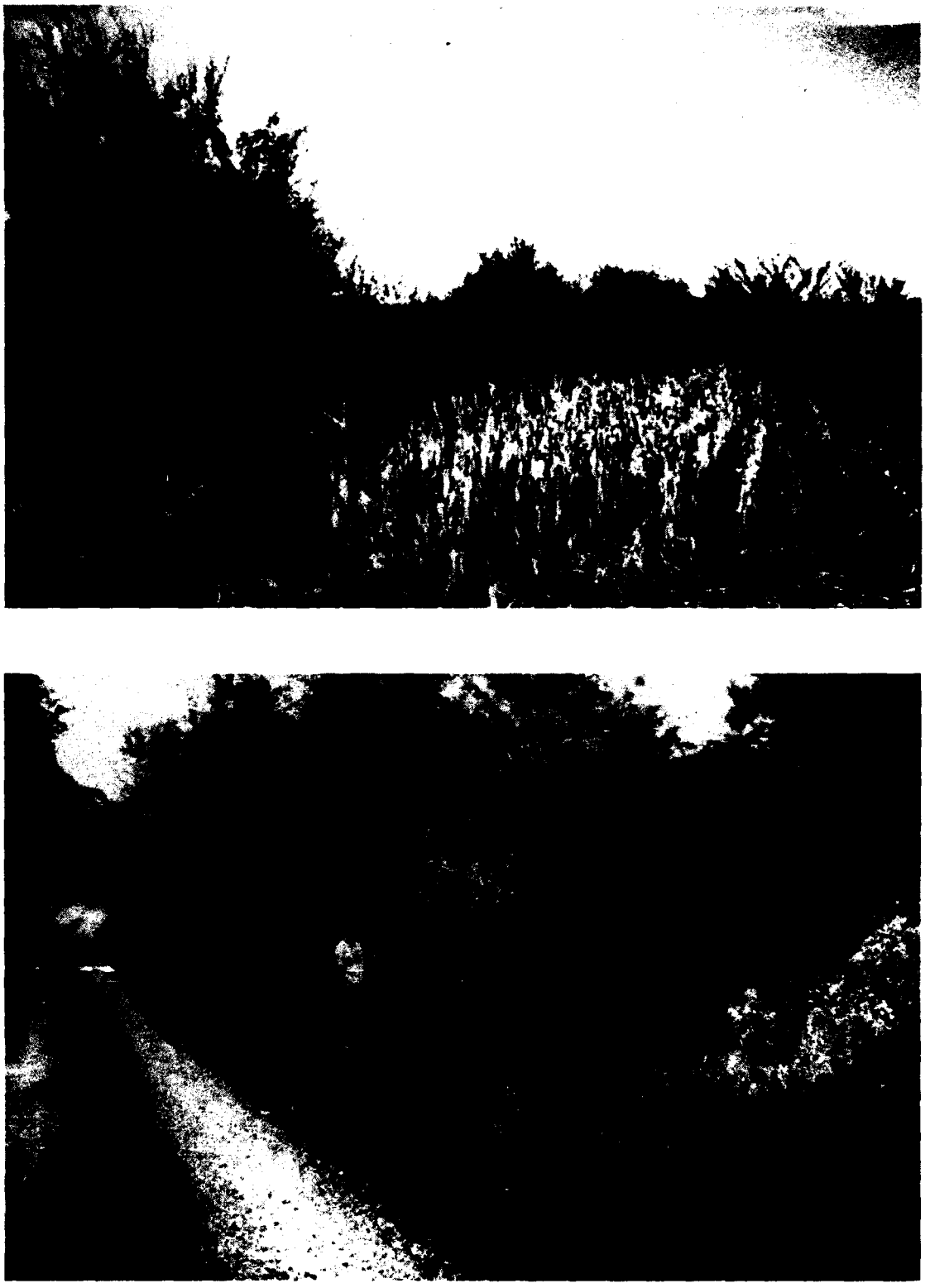

Figure 4. Autumn olive plantings established as a border along a field edge (top), and as a barrier or screen along an interior road (bottom)

plantings have also been used to delineate project boundaries, and thickets are sometimes planted as barriers along interior roads (Fig. 4). Because of its dense foliage near the ground, autumn olive has been used as a windbreak planting in portions of the Midwest. It should be planted on the side receiving the greatest amount of sunlight so as not to reduce its growth rate.

Landscape Improvement

Landscape management plans often include autumn olive as a potential species for planting in rural and suburban areas of the Northeast (SCS 1969, Sharp 1977, Dillon 1981) and Southeast (Thomas et al. 1983); it can also be used for landscape improvement in portions of the Midwest. Burger (1973) stated that autumn olive was adapted to urban conditions and tolerates city environments, but plants may grow too large to make good ornamental plantings on the ordinary city lot (Allan and Steiner 1972). However, where space allows, its silvery green foliage and red berries against a background of conifers or other plantings can improve the aesthetic appeal of the urban landscape (Allan and Steiner 1972, DeGraaf and Witman 1979). As in habitat development projects, autumn olive can be included in a mixture of conifers and deciduous trees and shrubs planted to provide a screen or barrier. Such plantings can also help abate noise levels in urban areas.

Site Restoration

Because it is a vigorous, nitrogen-fixing plant, autumn olive is useful for establishment on infertile sites such as strip-mine spoil banks, gravel pits, sandblown areas, roadsides, and along eroded gullies. Allan and Steiner (1972) stated that autumn olive was only moderately effective in controlling erosion; however, DeGraaf and Witman (1979) considered autumn olive as excellent for erosion control in the Northeast, and Vogel (1981) found plants to provide fairly rapid erosion control on strip-mine sites. Autumn olive is frequently used in planting mixtures with other hardy species to vegetate surface-mined lands and other critically disturbed sites (Plass 1975, 1978; Grandt 1977; Rafaill and Vogel 1978; Stormer et al. 1978; Whitmore 1978; Roth et al. 1979). The deep roots, light shade provided, and additional nitrogen encourage the establishment of grasses and other herbaceous plants that protect the soil surface (Allan and Steiner 1972). Autumn olive was recommended as a potential species for revegetating dredged material sites by Coastal Zone Resources Division (1978). Autumn olive may have some value as a

"nurse crop" species in mixtures planted to restore disturbed sites (Plass 1978, Vogel 1981).

WILDLIFE VALUE

Thickets or rows of fully grown autumn olive provide protective cover for many species of wildlife, and the abundant fruit (Fig. 5) is eaten by a variety of birds, primarily songbirds, and several species of mammals. The spreading branches also provide nesting sites for some songbird species. On good sites, autumn olive bears fruit and furnishes cover in its third season; 5 years may be required on poorer sites (Shomon et al. 1966, Allan and Steiner 1972, Burger 1973, Grandt 1977). Wildlife species known to use autumn olive as food and/or cover are listed in Table 1.

Birds have been reported to eat the fruit from ripening in September to late winter. Davison (1967) and DeGraaf and Witman (1979) listed the fruit as a choice food of the eastern bluebird,* cardinal, catbird, mockingbird, robin,

Figure 5. Autumn olive branches laden with fruit in mid-fall at Grenada Lake, Mississippi

* Scientific names of wildlife species are given in Table 1.

Table 1. Wildlife Species Reported to Use Autumn Olive as Food and/or Cover*

Species	Use	
	Food	Cover
Game birds		
Mallard (*Anas platyrhynchos*)	X	
Northern bobwhite (*Colinus virginianus*)	X	X
Ruffed grouse (*Bonasa umbellus*)	X	X
Mourning dove (*Zenaida macroura*)	X	X
Ring-necked pheasant (*Phasianus colchicus*)	X	X
Wild turkey (*Melagris gallopavo*)	X	X
Songbirds		
Northern flicker (*Colaptes auratus*)	X	
American crow (*Corvus brachyrhynchos*)	X	
Blue jay (*Cyanocitta cristata*)	X	
Northern mockingbird (*Mimus polyglottus*)	X	X
Gray catbird (*Dumetella carolinensis*)	X	X
Brown thrasher (*Toxostoma rufum*)	X	X
American robin (*Turdus migratorius*)	X	X
Eastern bluebird (*Sialia sialis*)	X	
Hermit thrush (*Catharus guttatus*)	X	
Veery (*C. fuscescens*)	X	
Cedar waxwing (*Bombycilla cedrorum*)	X	
Tree swallow (*Tachycineta bicolor*)	X	
Black-capped chickadee (*Parus atricapillus*)	X	
Carolina chickadee (*P. carolinensis*)	X	
Nuthatches (*Sitta* spp.)	X	
House wren (*Troglodytes aedon*)		X
American redstart (*Setophaga ruticilla*)		X
European starling (*Sturnus vulgaris*)	X	
House sparrow (*Passer domesticus*)	X	X
Yellow-rumped warbler (*Dendroica coronata*)	X	X
Common grackle (*Quiscalus quiscala*)	X	X
Northern cardinal (*Cardinalis cardinalis*)	X	X
Evening grosbeak (*Coccothraustes vespertinus*)	X	
Rose-breasted grosbeak (*Pheucticus ludovicianus*)	X	
Indigo bunting (*Passerina cyanea*)	X	X
Rufous-sided towhee (*Pipilo erythropthalmus*)	X	X
Purple finch (*Carpodacus cassinii*)	X	
House finch (*C. mexicanus*)	X	
Pine siskin (*Carduelis pinus*)	X	
American goldfinch (*C. tristis*)	X	
Dark-eyed junco (*Junco hyamalis*)	X	X
American tree sparrow (*Spizella arborea*)	X	X
Field sparrow (*S. pusilla*)	X	
Clay-colored sparrow (*S. pallida*)	X	

Continued

Table 1 (Concluded)

Species	Use: Food	Use: Cover
Harris' sparrow (*Zonotrichia querula*)	X	X
White-crowned sparrow (*Z. leucophrys*)	X	X
White-throated sparrow (*Z. albicollis*)	X	X
Song sparrow (*Melospiza melodia*)	X	X
Fox sparrow (*Passerella iliaca*)	X	X
Mammals		
Opossum (*Didelphis virginiana*)	X	X
Raccoon (*Procyon lotor*)	X	
Black bear (*Ursus americana*)	X	
Striped skunk (*Mephitis mephitis*)	X	X
Gray fox (*Urocyon cinereoargenteus*)	X	
Red fox (*Vulpes vulpes*)	X	
White-tailed deer (*Odocoileus virginianus*)	X	
Cottontail rabbits (*Sylvilagus* spp.)	X	X
Eastern chipmunk (*Tamias striatus*)	X	X
Woodchuck (*Mormota monax*)	X	X
Miscellaneous rodents	X	X

* Major references: Davison (1942, 1967), Engle (1962), Allan and Steiner (1972), DeGraaf and Witman (1979), Dillon (1981), Robel and Browning (1981), and Fowler et al. (1982).

tree swallow, hermit thrush, and cedar waxwing in the northeastern and north-central states. However, in a survey of autumn olive use at Carlisle Lake, Illinois, only starlings, robins, catbirds, and mockingbirds were documented to feed heavily on the berries; primary use was by starlings and robins (unpubl. data, US Army Engineer District, St. Louis). In the Southeast, autumn olive is listed as a good, but not choice, food of the mockingbird, catbird, brown thrasher, robin, eastern bluebird, thrushes, cedar waxwing, and cardinal (Dillon 1981).

Autumn olive has been noted as an excellent shrub for songbirds in the Great Plains states (Range 1984). Robel and Browning (1981) evaluated songbird use of woody vegetation planted on a 1.98-acre (0.8-ha) plot in northeastern Kansas and found that stands of autumn olive were highly used by approximately 10 species of granivorous (seed-eating) birds that frequented the area. The experimental site had 40 rows of 3- to 6-year-old trees and shrubs that were being evaluated for potential use in SCS conservation

projects; autumn olive plantings were 6 years old and averaged 13.5 ft (4.1 m) in height. Cardinal autumn olive was among 4 of 18 shrub species evaluated that received the majority of bird usage throughout the study. Highest foraging use was in the summer and fall by cardinals, house sparrows, Harris' sparrows, and white-throated sparrows. Autumn olive was used for reproductive activities (singing, courtship, and nesting) by both granivorous and insectivorous birds during spring and summer.

Game birds reported to be attracted to autumn olive include the bobwhite quail, ruffed grouse, mourning dove, ring-necked pheasant, and wild turkey (Shomon et al. 1966, Davison 1967, Allan and Steiner 1972). Although mallards have been documented to eat the fruit, such use should be considered incidental. Allan and Steiner (1972) commented that the fruit is often so heavily consumed by songbirds that there may be little left for game species in the fall and winter. The greatest value of autumn olive to game birds is perhaps the provision of escape cover for ground-dwelling species. Dimmick (1991) stated that autumn olive can provide suitable protective cover and travel lanes for bobwhites in 3 to 5 years; two rows spaced 6 to 9 ft (1.8 to 2.8 m) apart should grow into an effective cover strip about 15 ft (4.6 m) wide.

The fruit, leaves, and twigs are also eaten by several species of mammals, and plantings can provide cover and travel lanes for a variety of mammals and reptiles. Mammals reported to eat the fruit include the opossum, raccoon, black bear, skunks, foxes, woodchuck, and chipmunks (Engle 1962, Allan and Steiner 1972). Cottontail rabbits and white-tailed deer will browse the leaves, twigs, and bark, and a variety of rodents likely use the shrubs for food and/or cover.

Heavy consumption of autumn olive seeds by foxes was reported by Yearsley and Samuel (1980) in West Virginia, and by Fowler et al. (1982) in Tennessee. Both studies involved the examination of food items in fox scat on reclaimed coal surface mine habitat. Highest use of autumn olive was generally in the fall and early winter. Fowler et al. (1982) documented as many as 622 autumn olive seeds in a single fox scat in November, and Yearsley and Samuel (1980) found that fox scats deposited on surface mine sites during October were composed almost entirely of autumn olive seeds. Broken branches on autumn olive plantings in Tennessee indicated that foxes had climbed the shrubs to obtain fruit.

ESTABLISHMENT

Site Selection

Autumn olive is often recommended for dry, sandy slopes along roadsides and bridge abutments and is useful on upland sandy sites in coastal areas (DeGraaf and Witman 1979). It may be planted in mixtures with other woody species to provide hedgerows, windbreaks, and wildlife cover in a variety of upland sites where shrub habitat is lacking. Plants may be established on a wide range of mine soil types and conditions (Roth et al. 1979, Vogel 1981, Brown et al. 1983a,b). Initial growth and survival is usually good, even if planted in an established cover of herbaceous vegetation. The growth of other plants at the site is often enhanced by the nitrogen-fixing capability of autumn olive (Plass 1975).

Plantings for borders, hedgerows, windbreaks, and other strips respond best if the site is plowed, harrowed, and allowed to settle before planting. Removal of competing plants by scalping or other means may be necessary. Block plantings may be made in deep furrows or in spots from which sod has been scalped (Shomon et al. 1966, Allan and Steiner 1972).

Design Recommendations

Autumn olive may be satisfactorily established in block or row plantings or as a single shrub. For maximum effectiveness in wildlife management and landscape improvement, autumn olive should be planted in mixtures with other shrubs to improve habitat diversity at a site. Design recommendations to achieve a variety of effects are described below.

Block plantings. Spacing for autumn olive planted in blocks should be at least 8 × 8 ft (2.4 × 2.4 m); wider spacing may be used for small irregular clumps (Allan and Steiner 1972). Individual plantings should be spaced at least 12 ft (3.7 m) apart.

Hedgerows and windbreaks. Plants in hedgerows should be spaced at least 4 ft (1.2 m) and preferably 6 ft (1.8 m) apart, and rows spaced 10 ft (3.1 m) apart make a good windbreak (Shomon et al. 1966, Allan and Steiner 1972). Burger (1973) recommended planting at 6- to 8-ft (1.8- to 2.4-m) intervals in rows spaced 10 to 20 ft (3.0 to 6.1 m) apart. For windbreaks, rows of autumn olive should be planted adjacent to rows of conifers. It often makes an excellent outer row for a windbreak because of the dense foliage near the ground.

Border plantings. When used along borders, plants should be spaced 6 ft (1.8 m) apart in the row, and the rows should be about 10 ft (3.1 m) apart (Allan and Steiner 1972). Davison (1940) suggested that borders of a new woodland planting consist of shrubs in a strip 15 to 20 ft (4.6 to 6.1 m) wide. When used to border older stands, it is best to plant autumn olive at least 20 ft (6.1 m) from the base of the trees along the edge of the woods (Allan and Steiner 1972).

Propagule Selection

Planting stock of autumn olive is readily available, and several commercial nurseries now produce Cardinal autumn olive in quantity. Some State and Federal nurseries also produce autumn olive for wildlife management areas, strip-mine revegetation projects, and windbreak, shelterbelt, and highway roadside plantings. The Soil Conservation Service (SCS) has maintained foundation-quality seed production blocks at SCS plant materials centers. This seed stock is available to SCS Districts and cooperating State and Federal agencies. Plants have also been provided to cooperating non-government nurseries and organizations for establishment of seed production stock on their lands (Allan and Steiner 1972).

Plants may be grown from seeds, seedlings, stem cuttings, layers, and grafts (Allan and Steiner 1972, DeGraaf and Witman 1979). Managers should consult with regional SCS personnel and other plant materials specialists for guidance on the most appropriate cultivars and planting stock to use on their management areas.

Seedlings are generally used to establish stands or rows of autumn olive in conservation plantings. However, resource personnel may wish to develop a source of readily available propagules for future plantings. The information below relates primarily to planting-stock production of Cardinal autumn olive.

Seeds. The highest seed yields are obtained from improved strains that result from plantings made especially for seed production. A seed production planting should be in full sun on a well-drained soil. The plants should be spaced at least 6 ft (1.8 m) apart within rows, and the rows should be spaced 25 ft (7.6 m) apart. Fruit production will usually begin when the plants are 3 to 5 years old (Allan and Steiner 1972).

Germination of good seed ranges from 50% to 60%. Whole fruit should be planted promptly after picking or stored at a low temperature until planting to prevent spoiling. Fruits used for seed should be collected in the fall as

soon as they turn red; if not collected early, they will be eaten by birds. A tarp or sheet spread on the ground beneath the limbs will catch most of the fruit as it is stripped from the tree (Allan and Steiner 1972, Olson 1974).

To clean the seeds for planting, storing, or shipping, they should be promptly removed from the pulp to prevent fermentation and damage from heat. The fruits may be lightly mashed against a 1/8-in. (3.1-mm) hardware cloth screen with a small block of wood covered with hardware cloth. If excessive pressure is applied, the seeds can be damaged. A water spray can be used to wash the mashed pulp through the screen until only clean seeds remain. The seeds should be laid on a clean surface in the open shade to dry; they should then be stored in a cool, dry place (Allan and Steiner 1972).

If seeds are to be planted the following spring, they should be stratified and stored properly. To stratify, clean seeds may be soaked in cool water for 24 hours, drained, placed in plastic bags, and refrigerated for 30 to 45 days at 36° to 38° F (2.2° to 3.3° C). The seed should be processed early enough so that stratification is completed by the time of normal spring planting (Allan and Steiner 1972).

Ten pounds (4.5 kg) of fresh fruits usually yield slightly more than 1 lb (0.45 kg) of clean seeds, or approximately 22,000 seeds (Allan and Steiner 1972). Olson (1974) reported somewhat higher yields, with fruits producing an average of 27,000 seeds per pound.

Transplants. Planting stock for permanent transplanting can usually be grown in one growing season, but seedlings produced in the shorter growing seasons of northern latitudes may require 2 years. One pound (0.45 kg) of planted seed should result in 3000 to 4000 usable 1-year-old seedlings but may yield more if held for 2 years.

Transplants for field plantings should be at least 10 in. (25.4 cm) tall and have a lower stem diameter of not less than 0.18 in. (0.5 cm). Stock can be dug in the fall following leaf drop or in the spring while the plants are still dormant. Weak and spindly plants should be discarded. Bare-root seedlings survive storage, shipping, and transplanting well if they are kept cool and moist until planted (Shomon et al. 1966, Allan and Steiner 1972).

Cuttings. Planting stock of autumn olive can also be produced from cuttings. Either softwood or hardwood cuttings can be used to propagate individual plants selected for particular characteristics (Allan and Steiner 1972).

Although desired fruit crops of Ellagood autumn olive cannot be produced from seedlings, this cultivar is relatively easy to propagate from 1-year-old hardwood cuttings, which can be rooted either in the greenhouse or at field sites. The dormant cuttings should be taken in February or early March and stored in a cold room to maintain dormancy until planted. The ideal cutting is 0.5 in. (1.2 cm) and should not be less than 0.38 in. (0.4 cm). When Ellagood is pruned severely, an abundance of new shoots are produced (SCS, undated).

Planting Methods

Seeding. Late October is the best time for planting seeds since they need to be placed in wet, cold soil over winter to result in good germination. If fall seeding is impractical, the seed can be stratified and planted the following spring; the results are usually satisfactory but less predictable than with fall plantings (Allan and Steiner 1972).

The best seedbeds are composed of well-drained loamy soil, peat moss, or organic matter mixed thoroughly into sandy soil. Seedbeds should be firmed with a roller or cultipacker before seeding. A roller is recommended to prepare a flat, even surface before either broadcasting or drilling seed. To obtain a row effect without drilling, a cultipacker with 4-in. (10.2-cm) corrugations may be used to firm the bed; the fruit or seed will collect in these corrugations (Allan and Steiner 1972).

Seeds may be planted in rows using a mechanical drill or broadcast seeder. For planting-stock production, seedbeds should be 3 to 4 in. (7.6 to 10.1 cm) above field elevation and 4 ft (1.2 m) wide; access paths should be provided between the beds to facilitate cultivation. In row plantings, the rows should be 8 to 10 in. (20.3 to 25.4 cm) apart, and seeds should be planted 0.5 in. (1.3 cm) deep at the rate of 25 seeds per linear foot of row; no additional covering of the seed is needed. For broadcast seeding, 6 oz (170.1 g) of clean seed or 4 lb (1.8 kg) of fresh fruit should be sown for each 48 sq ft (4.5 sq m) of seedbed. The seed or fruit should then be covered with 0.5 in. (1.3 cm) of weed-free or fumigated sand (Allan and Steiner 1972).

After seeding, the seedbed should be mulched with weed-free or fumigated straw placed 2 to 3 straws deep. If spread deeper, the mulch should be removed as seedlings emerge. In winter, snow fence or woven wire may be used to hold the mulch in place; it should then removed just before germination begins (Allan and Steiner 1972).

Seedlings. Careful planting of seedlings usually results in successful establishment. One- or 2-year-old seedling stock is normally used. Seedlings are usually transplanted in the fall after leaf drop or in spring while the plants are still dormant.

Roots of the seedling stock must be kept moist until planted. Holes for the plants should be deep enough to take the full root without bending. Unusually long roots and tops may be pruned to 6 in. (15.2 cm) if considered desirable. After the seedling has been set in the hole, the soil should be packed firmly around the roots and tamped down.

On poor soils, a moderate amount of 5-10-5 or 10-10-10 fertilizer applied to each plant will help initiate growth. The fertilizer should be well mixed with soil. Mulches of straw, sawdust, or wood chips may be used to cool the microclimate and reduce moisture loss, especially on dry sites (Shomon et al. 1966, Allan and Steiner 1972).

For best fruit yields, seedlings should be planted in blocks with 8-ft (2.5-m) spacings between plants, or at 6- to 8-ft (1.8- to 2.5-m) intervals in rows spaced 10 to 20 ft (3.1 to 6.1 m) apart. Closer spacing can be used if the management goal is to provide dense escape cover; however, occasional clipping may be required (Burger 1973).

Cuttings. The following guidelines for establishing cuttings were developed for the Ellagood variety of autumn olive (SCS, undated). First, a raised bed should be prepared in a well-drained, sandy loam soil. The bed height should be 4 to 6 in. (10 to 15 cm) above field elevation to facilitate drainage and cultural operations.

Prepared cuttings should be approximately 8 in. (20 cm) long. The basal end of the prepared cutting should be treated with a growth hormone such as rootone 10. The treated cutting is inserted in the raised bed to a depth of 4 in. (10 cm); plantings deeper than 4 in. result in digging problems, and shallower placement will inhibit or delay root growth. The planted area should be lightly mulched to reduce evaporation, and an irrigation source is needed to ensure moisture for rapid rooting and early growth.

Cuttings that remain in the bed for a year are large enough for field planting. Successful cuttings will be about 2 ft (0.6 m) tall and will have a good root system and several nicely formed branches at the end of the first year (SCS, undated).

MAINTENANCE

Autumn olive requires little maintenance after fully established. To maximize growth of young plants, they should be irrigated, and a soluble 1-1-1 ratio fertilizer should be used in the irrigation water until late July. Rates and frequency of application depend on soil requirements and length of the growing season. Topdressing fertilizer can also be used if the beds are irrigated thoroughly and immediately to prevent chemical burning (Allan and Steiner 1972).

Seedbeds, sand, and mulch should be weed-free when used. If weeds are present in the seedbeds, manual or chemical weeding may be necessary. Beds planted in rows are easier to weed mechanically than are broadcast beds, and hand-weeding can be reduced to a minimum. Cultivation around the plants for several years should enhance growth (Allan and Steiner 1972).

If autumn olive plantings are primarily intended to provide escape cover, shrubs should be clipped at 3- to 5-year intervals; however, this practice reduces fruit production (Burger 1973). Multistemmed shrubs, such as autumn olive, often grow tall and spindly after 8 to 10 years. Also, the lower branches and some main stems die and fruit production declines; thus, their effectiveness as escape cover and a food source for wildlife is substantially diminished. When this occurs, full usefulness can often be restored by severe pruning to a few inches above ground, which may be done by hand or with a rotary mower in late winter or early spring. Severe pruning will create a multitude of new sprouts and stems and can result in much improved cover and fruit production within 2 seasons (Burger 1973).

CAUTIONS AND LIMITATIONS

Herbicide Tolerance

Autumn olive has been reported to be sensitive to herbicides, and plant growth is usually impaired by chemicals such as 2,4-D and 2,4,5-T. Aerial application of certain herbicides can adversely affect the shrubs during growth periods; therefore, caution should be taken not to directly spray the plants or expose them to aerial drift. Dumke (1982) found no adverse effects from the use of selected chemicals on autumn olive planting stock. The herbicides used in his study (Picloram Ammate-X-N1, Krenite, Roundup, and Simazine) were not applied directly to the plants but were used along the periphery of plantings to control competing herbaceous vegetation.

Dieback

As plants become older, a dieback of branches often occurs. As many as 25% of the plants in an area may be affected in the most severe cases, which appear to be related to high fertility and moisture levels; disease injury has been recorded for less than 25% of the affected plants. The relationships between dieback and environmental conditions or causative agents have not been determined (SCS, undated). As previously noted, plants may become tall and spindly after 8 to 10 years, and the lower branches and main stems may die. Burger (1973) recommended severe pruning to restore damaged plants to their full usefulness.

Animal Damage

Autumn olive is sometimes heavily browsed by deer and nipped by rabbits, but this does not generally result in permanent damage. However, severe girdling by mice will occasionally kill plants. Rodent damage is most likely in areas of heavy grass or weed cover. Autumn olive is relatively free of insect pests (Allan and Steiner 1972).

Spreading

Autumn olive has a tendency to spread and may increase on idle land, where it is known to form naturalized thickets. It has been reported to escape from cultivation and spread to roadsides, sandblown areas, strip-mine spoil banks, and old fields, where it is generally not considered a pest (Shomon et al. 1966, Allan and Steiner 1972, Vogel 1981). However, plants have been documented to spread onto unmanaged and poorly managed pastureland in West Virginia, and cultivation of autumn olive has been banned in several counties in the State (Vogel 1981). Plants have escaped from cultivation and spread to waste areas and roadside thickets in the Northeast (DeGraaf and Witman 1972). Dispersal is usually by seed, but plants can spread locally by vegetative means. The manager should be aware of the potential for autumn olive to spread, and ensure that plantings do not create a control problem.

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